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ABSTRACT

This final report summarizes the purpose, procedures, and results of a study, initiated in 1980, which investigated the interrelationships among motivational variables related to 423 fourth through sixth grade students' sense of efficacy in the classroom, or classroom motivation. Sense of efficacy was initially defined as a student's perception of personal control over and responsibility for classroom learning experiences. This was construed as a dynamic process involving interactions among motivational and achievement characteristics of the learning environment. Measures of both personal characteristics and classroom characteristics were included. The study explored linkages among different motivational theories and conceptualized motivation as influenced both by person and situation characteristics. Study results are presented in three parts. First, results of analyses of interrelationships among student motivational and achievement variables are summarized. Second, the results of analyses of the classroom data set alone are presented, and third, findings regarding the relationships between student and classroom characteristics are listed. (Seventeen tables based on data analysis are included in the document.) (JD)

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FINAL REPORT

FOR

A CONCEPTUAL STUDY OF STUDENTS' SENSE OF EFFICACY

Jennifer C. Greene
University of Rhode Island (#5-30430)

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FOREWARD

This final report summarizes the purpose, procedures, and results of an NIE-funded "Conceptual Study of Students' Sense of Efficacy." The research study was initiated in September, 1980 and is now complete except for a few tangential data analyses of interest (e.g., analyzing the different responses obtained from the two attribution instruments).

Previous reports on this study provided detailed accounts of instrumentation and data collection procedures (NIE Progress Report of August, 1981) and of results for the student-level motivational and achievement variables in the study (NIE Progress Report of January, 1982 and AERA paper presentation of March, 1982). These procedures and results are summarized in this report, using in some instances excerpts from earlier reports or papers. This final report then presents the major results of analyses on the classroom-level data collected and on the relationships found between the student-level and classroom-level variables. This latter set of results will also be presented in a paper at the 1983 AERA Annual Meeting.

THEORETICAL PERSPECTIVE

The major purpose of this study was to investigate the interrelationships among motivational variables related to students' sense of efficacy in the classroom (or classroom motivation). Sense of efficacy was initially defined as a student's perceptions of personal control over and responsibility for his/her own classroom learning experiences. This construct was further construed as a dynamic process involving interactions among motivational and achievement characteristics of the learning environment. The study thus included measures of both person characteristics (six different motivational variables drawn from various strands of motivational research and school achievement) and classroom characteristics.

The present study was a conceptual one, focused on enhancing our understanding of classroom motivation by (a) exploring linkages among different motivational theories and (b) conceptualizing motivation as influenced both by person and situation characteristics. That is, this study reflects an ATI philosophy and is appropriately labelled an investigation of "naturally occurring ATI." However, under the belief that motivation and achievement influence each other in cyclical fashion (vs. a belief in linear causality), both constructs are considered as both aptitudes and dependent variables in this study. In addition, the conceptual definition of "treatment" in this study is the regular classroom learning environment. Operationally, the treatment was defined as those classroom characteristics selected for measurement.

METHOD

The Research Sample

The participants in this study were 423 fourth-sixth graders and their 21 teachers from three suburban-rural school districts. Based on student self-report, the sample can be characterized as predominantly Caucasian (92 percent), evenly divided between males (53 percent) and females (47 percent), and representative of all socioeconomic strata (e.g., ranging from 14 percent in the unskilled/semi-skilled worker category to 20 percent in the professional category). Participation was predicated on both teacher and written parental consent. (On the average, 84.7 percent of the students in each class received parental permission to participate.)

Variables and Instrumentation

Wherever possible, existing instruments were used or adapted for use in this study for three major reasons. First, by using existing instruments, the results of this study can be evaluated within research strands that have used the same instruments. Second, the major purpose of this study was to assess the interrelationships among extant motivational constructs related to classroom learning. Use of existing instruments for these constructs is a logical element of research design. Third, the primary concern underlying this study is the rather tenuous state of the art regarding motivational theory and research. Motivation is widely recognized as a critical component of learning, yet our ability to define and measure motivational constructs remains limited.

This study aimed at better definition. Improved measurement is a future step.

Student Variables and Instrumentation

Three sets of student characteristics were measured: demographic, motivational, and achievement.

Demographic characteristics. Students' grade level, sex, ethnicity, and parent's occupation were measured by a questionnaire entitled "Things About Yourself." All questionnaire items had been used successfully with fourth graders in several years of a statewide assessment program and in a pilot test conducted for the present study.

Motivational characteristics. Drawing from several major strands of motivational research, this study measured six different motivational characteristics. Table 1 identifies the instruments used to measure these characteristics and provides both sample items and reliability estimates where appropriate.[1]

Locus of control (LOC) was measured by the 34-item forced-choice Intellectual Achievement Responsibility scale (IAR; Crandall, Katkovsky, & Crandall, 1965; Crandall, Katkovsky, & Preston, 1962). The IAR is based on a relatively concise conceptualization of the LOC construct, as it restricts the context to academic situations, differentiates between perceptions of control for success and failure experiences, and restricts the meaning of external control to significant others (parents, teachers, peers) in the child's educational environment. The IAR yields three scores, derived by tallying the number of internal responses marked: I+ (internality for success), I- (internality for failure) and I_{tot} (a sum of I+ and I-).

Table 1

Motivational Measures Used in the Study

Variable/Instrument	Sample item	Reliability estimate
Locus of control	If a teacher passes you to the next grade, would it probably be because she liked you, or because of the work you did?	for I+ = .53 for I- = .64 for I_{tot} = .67
Expectancy of success	How well do you do in your mathematics lessons?	= .87
Incentive value of success	If you had to choose between two things to do, which would you pick? Learning how to read a story. Going on a hike outside.	= .71
Causal attributions for success and failure		
Part I	When I do well on my school work, it is usually because I'm good at school work. I tried hard.	Percent agreement of responses to parallel item pairs ranged from 59 to 92 percent.
Part II	When I do poorly in school, it is because My schoolwork is too hard.	
School Attitude Measure		
Self-concept, performance based	I am very proud of the work I am doing in school.	= .68
Self-concept, reference based	I don't like to tell my grades to others in my class.	= .74
Motivation for schooling	I look forward to each school year.	= .79
Sense of control over performance	I cross my fingers for luck before I take a test.	= .64
Instructional mastery	I usually have enough time to finish my work.	= .75
Achievement motivation	A father and his son talking about something important.	Interscorer agreement among three scorers ranged from 77 to 90 percent.

The expectancy of success measure was developed by the researcher, based on previous work by Crandall (1963) and Mischel and Staub (1965), and had been used in two previous studies. The instrument consists of 11 columns of 25 stick figures each, one sample and 10 scored items. Students were instructed that the stick figures represented children their age in their own town who were like them and further, that the top/bottom figures in each column represented the child who does the best/poorest at a given task. For each column, students were asked a question of the form, "How well do you...?" and responded by circling the figure representing their estimation of their own success at that task. Each item was scored on a scale of 1 to 25 and a total score was derived by averaging the responses made.

The incentive value measure was developed by the researcher and used in one previous study. Each of its 10 forced-choice items contrasts a successful academic experience with a successful or enjoyable nonacademic experience in the domain of sports, playing with friends, or free time. For each item, children were instructed to mark the activity they would pick, if they had to pick one of the two. The instrument yielded one score, obtained by totaling the number of academic activities marked.

Children's causal attributions for their academic success and failure experiences were measured in two different ways. Part I, again developed and used previously by the researcher, consists of 24 forced-choice items, 12 referenced to academic success situations and 12 to academic failure situations. The six possible pairings of the four causes originally defined in attribution theory (ability, effort, task difficulty, and luck; Weiner, Frieze, Kukla, Reed, Rest, & Rosenbaum, 1971) form the responses. Part I yields eight scores, one for each of

the four causal elements for both success and failure, each ranging from 0 to 6. Given the forced-choice format, these scores are ipsative, always totaling 24.

The development of Part II of this instrument was based on an interest in a multimethod approach to attribution measurement and on recent theoretical and measurement advances in attribution theory. Weiner (1979), for example, has expanded the theoretical framework for attributions to include a third causal dimension and several additional major causes (e.g., mood, teacher bias, temporary effort). Elig and Frieze (1979) have suggested that independent evaluation of the importance of each cause, compared to choosing among causes, is the preferred measurement format. Therefore, Part II of this study's attribution instrument contains statements of six reasons for doing poorly in school and a parallel set of six reasons for doing well in school (ability, effort, task difficulty, luck, task interest, and teacher bias). Students were asked to assess how often each reason was true for them on a five-point scale ("almost never" to "almost always").[2] Part II yields 12 raw scores, one for each item.

The School Attitude Measure (SAM) was used to measure students' academic self-concept. This recent standardized instrument (Dolan & Enos, 1980) contains five scales, including both a performance-based and a reference-based measure of academic self-concept. The former measures students' confidence in their academic abilities and their feelings about their school performance, while the latter assesses students' perceptions of their school performance in relation to other people's (teachers, family, friends) expectations for and feelings about this performance. The motivation for schooling and sense of control over performance scales of the SAM assess constructs similar in definition to the incentive value

and LOC constructs respectively already included in the study, thus providing a second measure for each of these variables. The final SAM scale was a measure of students' instructional mastery, defined as students' self-evaluations of such learning skills as attention, persistence, time management, and responsiveness to feedback. The SAM contains 75 statements, 15 per scale, to which students responded on a four-point scale of agreement ("never agree" to "always agree").

Teacher perceptions of students' academic self-concept were also collected using two items from the SAM, one from each self-concept scale. Teachers were asked to provide what they believed to be an "accurate" response to both items for each student in their class. The rationale for this measurement was the importance given in the literature to the accuracy of a student's self-concept (Nicholls, 1979; Stipek, 1981).

Finally, following the long-established tradition in achievement motivation research, a form of the projective Thematic Apperception Test (TAT) was used in this study. Verbal leads, rather than pictures were used, primarily for logistical reasons. Both the leads and the guiding questions for each of the four stories were taken from McClelland Atkinson, Clark, and Lowell, 1953. An abbreviated version of the prescribed TAT scoring system was used, yielding one overall score, ranging from -4 to 20.

Achievement characteristics. In an effort to minimize the classroom instructional time required by the study, existing measures of achievement were extracted from school files, including: (a) national percentiles from a recently administered standardized achievement test for reading, language arts, math, and total achievement; (b) deviation IQ scores from a group administered, standardized intelligence test (available for 97 students from six classes); (c) median academic grades

(A to F, converted to a numerical five-point scale) from the current or previous year for reading, language arts, and math; and (d) median effort grades ("commendable" to "unsatisfactory," converted to a numerical four-point scale) from the current or previous year for reading, language arts, and math (available for 115 students in six classes). In addition, teacher perceptions of student achievement were obtained via ratings of each student's learning performance on a normative five-point scale (from "bottom of the class" to "top of the class").

Classroom Variables and Instrumentation

The intent of the classroom data collection component of this study was to provide a characterization of the learning environment of each participating classroom in terms of general dimensions hypothesized to be related to students' motivation. Toward this end, classroom information was collected from two major sources.

First, student and teacher perceptions of classroom climate were collected using five scales from Moos' Classroom Environment Scale (CES) (Moos, 1979; Moos & Trickett, 1974), edited for use with younger students. The five scales and corresponding Cronbach α reliability estimates for students were involvement (.63), task orientation (.50), order and organization (.82), rule clarity (.56), and innovation (.55).

Second, a project-developed classroom observation instrument was used to measure three sets of classroom characteristics. Part I of this instrument measured low-inference demographic and physical characteristics (e.g., class size, number of adults present, noise level). Part II measured four dimensions of the learning environment: grouping structure, teacher behavior when not interacting with a large or small group of students, audience for and content of teacher verbal behavior,

and level of student task absorption. Part III was designed to collect observers' perceptions of 10 dimensions of the classroom learning environment (also derived primarily from Moos' CES). During a reliability check, percent agreement among the three observers for the individual items in Parts I and II ranged from 73 to 100, and the intraclass correlation for Part III was .95.

Three trained observers used this instrument to conduct five one-hour observations in each classroom, primarily during reading instruction (by design). Parts I and III were completed at the beginning and end of the hour respectively. In Part II, the items pertaining to grouping, teacher behavior, and student behavior were coded once every five minutes for a total of 10 blocks per observation. Student behavior coding was based on observations of individual randomly identified students. The design of the instrument called for observations of individual students who were working <u>with</u> the teacher during alternate blocks, beginning with the first, and for observations of individual students who were <u>not</u> working with the teacher during the remaining blocks. That is, to the degree possible, half the student behavior observations were to be based on students interacting with the teacher and half on students not interacting with the teacher. Finally, teacher verbal behavior was coded only during observations of students who were with the teacher. A complete listing of all variables on the observation instrument is presented in Table 2.

Table 2

Classroom Observation Instrument Variables

	Dimension	Variables
Part I	Demographic	Grade level Class size Adults present (teacher, substitute, student teacher, aide, volunteer)
	Physical	Class space (self-contained, open, portable) Seating pattern (stationery vs. movable, rows vs. groups of desks) Use of space (seating pattern constant vs. changing) Noise level
	Subject matter	Content (reading, language arts, other instructional, noninstructional) Time for each content area
Part II	Grouping structure	Individual seatwork, individual with teacher, total group with teacher, small group with teacher, structured groups without teacher, free/unstructured groups or individuals
	Teacher behavior when not with small/large group	Time observed Interacting vs. not interacting with students
	Teacher verbal behavior	Audience (whole class, small group, individual) Content (subject matter-telling, questioning, maintaining activity; routine procedures; student behavior)
	Student behavior	Assigned task (same as "grouping structure") Choice (none, limited, complete) Task absorption (disruptive, off-task, routine, moderate)
Part III	Observer perceptions of climate	Rule clarity, rule enforcement, noninstructional order and organization, instructional order and organization, individualization, task orientation, interest/attention, affect, affiliation, choice

A final source of classroom level information were the classroom narratives written by the observers. Because each observer remained with the same classrooms throughout the study, she became quite familiar with the environment, interactions, and characteristics of those classrooms. In the narratives, observers were asked to describe in a few paragraphs the dominant and/or unique characteristics of each of their classrooms, keeping in mind the conceptual framework of the study. While purposefully unstructured and open-ended, it was hoped that these narratives would provide an additional context within which to interpret the quantitative results of the study. (Unfortunately, narratives were written by only two of the three observers, representing 15 of the 21 classrooms.)

Data Collection Procedures

The three observers trained to conduct the classroom observations also served as data collectors for the other components of the study. As noted earlier, each observer worked with the same set of classrooms throughout the study, thus confounding observer with classroom effects, but strengthening the critical links of rapport and cooperation between the research staff and the practitioners. The observers' data collection responsibilities included five separate activities for each participating classroom: (a) administering the demographic and motivational student instruments, (b) administering the teacher instruments (assessments of students' self-concept and learning and perceptions of climate), (c) conducting the five classroom observations (following an introductory visit), (d) collecting the achievement data from school files, and (e) writing the classroom narratives.

Administration of the student instruments was carefully divided into three separate one-hour sessions in order to minimize classroom disruption and fatigue or boredom for students. For this reason, the same sequencing of instruments was maintained in all classrooms. A complete set of observer instructions for these instruments was developed, including (a) a set of general instructions and time estimates for all three sessions, (b) an introductory statement for students emphasizing the fact that the instruments did not have right or wrong answers and that individual responses would not be shared with teachers nor counted as part of students' grades, and (c) specific instructions for each instrument and for transitions between instruments and sessions. Administration of the student instruments was conducted during March - May, 1981.

Following their training period, observers conducted the classroom observations from December, 1980 through June, 1981. The teacher instruments were self-administered. Observers delivered these instruments to the teachers, who then returned them when completed. Finally, school file data were collected from each school in May and June of 1981 and the classroom narratives were completed by September, 1981.

RESULTS AND DISCUSSION

The results from this study are presented in three parts. First presented are the results of analyses of the interrelationships among student motivational and achievement variables. Since these results have been presented and discussed extensively in previous reports, they are presented only in summary form herein. Second, the results of analyses

of the classroom data set alone are presented, followed by findings regarding the relationships between student and classroom characteristics.

Student-Level Results

Statistical analyses for this phase of the study focused on exploring the relationships within and between the motivational and achievement variables. Using students as the unit of analysis, these analyses yielded two overlapping, but nevertheless distinct clusters of motivational variables, one dominated by ability factors (labelled ability orientation) and the other by effort factors (labelled effort orientation), and one achievement cluster. Further, ability orientation showed a moderate relationship to achievement, while links between effort orientation and achievement were substantially weaker.

Included in the ability orientation cluster were the following variables: self-concept of ability (performance- and reference-based), expectancy of success, and causal attributions for academic success and failure experiences to ability factors. More specifically, students with a "high" profile on this cluster had a high self-concept of ability, a high expectancy of doing well in school, attributed academic success to ability, and did not attribute academic failure to lack of ability but showed no consistent preference among the other failure attributions. Students with a "low" profile on this cluster had a low self-concept of ability and a low expectancy of success, did not attribute academic success to ability, showed some tendency to attribute success to luck, and attributed academic failure to lack of ability.

The effort orientation cluster included locus of control (I+ and I-), incentive value, and causal attributions for both academic success and

failure experiences to effort. That is, a student with a "high" profile on this cluster perceived that she/he had internal control over the reinforcements of both academic success and failure experiences, believed that doing well in school is important, and attributed school successes to high effort and school failures to insufficient effort. A "low" profile student perceived that academic reinforcements were externally controlled, did not value school success, and did not attribute either success or failure to effort but showed no consistent preference for any other causal ascription.

The achievement cluster, resulting from a principal axis factor analysis accounting for 91.4 percent of the variance, included academic grades, achievement test scores, and teacher ratings of student learning. (IQ scores and effort grades were excluded from this analysis because they were only available for subsamples of students.)

Analyses of composite variables representing each of those three clusters yielded a few demographic differences and extensive class differences. For example, there were no sex or grade level differences in mean ability orientation scores, but significant differences for effort orientation, with higher mean scores for females and fourth graders respectively. Mean ability orientation and achievement scores generally increased with socioeconomic status, while students in the lowest socioeconomic stratum had the highest mean effort orientation score. The range in class means for ability orientation was -4.12 to 2.95.

The consistency of these results with previous research is fairly high, with two notable exceptions: (1) the absence of failure attributions to effort in the ability orientation cluster and (2) the generally nonsignificant relationships found between the effort

orientation variables, particularly LOC, and the achievement measures. These departures from previous research, however, were incorporated into an extensive effort to interpret the results from this study via an integration of major constructs and empirical findings across extant strands of motivational theory. Included in this interpretive effort were developmental perspectives on causal and self-perceptions (Harari & Covington, 1981; Jagacinski & Nicholls, Note 1; Nicholls, 1979; Stipek, 1981; Stipek & Weisz, 1981); self-worth perspectives on achievement motivation (Covington & Omelich, 1981; Covington, Spratt, & Omelich, 1980; Fyans & Maehr, 1979); Bandura's (1977, 1982) theoretical ideas on self-efficacy; and perspectives presented by the broad domain of perceived personal control (e.g., deCharms, 1972, 1976, 1979; Perlmuter & Monty, 1979). A summary of the results of this interpretive effort is offered below.

This correlational study yielded two overlapping, but nevertheless distinct multifactorial motivational constructs relevant to elementary school children's classroom learning experiences. Though these constructs may represent consistent individual differences in motivational style, for the present time, it is suggested that they represent differences in motivational behaviors which all individuals display, depending on the situation. At the heart of this difference is the degree to which one's self-evaluation of ability vis-a-vis the task is certain or known and accurate or realistic. Certainty and accuracy here are different dimensions. First, given certainty in ability self-appraisal, this knowledge is used to help determine such learning behaviors as effort expenditure, attention, task orientation, and persistence, and then task outcomes are evaluated in terms of their meaning for this self-appraisal of ability. Given uncertainty regarding

one's ability to perform a given task (as in novel tasks), the major influences on motivational behavior are not ability evaluations, but rather evaluations of the importance of task success and of the controllability of task outcomes or the perceived contingency between effort and outcomes. These evaluations, in turn, influence learning behaviors, and then task outcomes are evaluated both as feedback to one's perception of control/contingency and as new information regarding one's learning ability.

It is further suggested that, except for the youngest school-age children, ability orientation is the dominant influence on motivational behavior in classroom learning situations, largely because most of these situations are familiar ones in which students' self-evaluations of ability are known (Bar-tal, Raviv, Raviv, & Bar-tal, 1982). In addition, these self- evaluations and thus ability orientation as a whole are (a) related to, but also distinguishable from actual ability, and (b) generally normative or derived from social comparisons, rather than self- or criterion-referenced. In situations where students' self-perceptions of ability are uncertain or unknown (as is the case for the youngest school-age children), effort orientation becomes prominent.

Finally, regarding the accuracy of ability self-perceptions within an ability orientation,[3] it is suggested that such accuracy is required for the development and maintenance of positive feelings of efficacy or competence. Inaccurate self-perceptions can lead to inappropriate learning behaviors (e.g., too little effort, too much persistence) and, cyclically, to erroneous or inapplicable feedback regarding these self-perceptions.

To use an important example, this line of reasoning evokes a red flag of caution regarding recent interventions designed to change students'

causal perceptions for failure from ability to effort (e.g., Andrews & deBus, 1978; Dweck, 1975; Fowler & Peterson, 1981). These interventions are based on the following tenet of attribution theory:

> It is primarily the attribution of achievement outcomes, particularly failure outcomes, to effort that contributes to the development and maintenance of positive achievement orientation and a belief in personal control. (Ames & Ames, 1981, p. 411)

Yet, if effort attributions are unrelated to feelings of efficacy, mastery, or personal control (as suggested by the present study), interventions designed to enhance effort attributions may have little impact on these feelings. This study further suggests that interventions should be targeted at facilitating accurate self-appraisals of ability. After all, students at all ability levels can successfully perform some tasks. This caution echos warnings recently voiced elsewhere:

> These findings suggest the need for caution in the use of effort attributions to correct cognitive deficiences. ... Present research lends support to the idea that children's self-perceptions have an important effect on their subsequent achievements. (Schunk, 1981, p. 103 and 104).

> [These findings suggest] that attempts to develop educational environments that focus attention on effort may not achieve the goal of maintaining positive perceptions of ability. (Stipek, 1981, p. 409-410)

Classroom-Level Results

Analyses of the classroom data set were designed around three objectives: (a) to provide an accurate and comprehensive description of the classes in the research sample, including the clustering of similar classes as appropriate; (b) to assess the interrelationships among classroom variables, both for descriptive and data-reduction purposes; and (c) to identify key variables for further analysis in conjunction with the student-level results. During the course of these analyses, some variables were deleted (due to low frequency or little variance). Others were combined, and new variables were also created. In the interest of both parsimony and reader attention span, only the final results of these analyses are presented herein. In these final results, all variables have been aggregated across the five observations per class. The results of all the steps in between the raw data and these final results (including the false starts and dead ends), however, are readily available upon request.

Descriptive Results

Demographic and physical characteristics. The data collected in Part I of the observation instrument proved useful only in describing this sample of classrooms. That is, with one exception, these variables either had little variance or showed no relationships to any other classroom- or student-level variables.

More specifically, by design, all classes contained fourth, fifth and/or sixth graders and nearly all observations were conducted wholly during reading or language arts instruction. In addition, this group of classrooms was highly similar on the following characteristics: the

absence of any other adults except the teacher, a self-contained physical space, and a seating pattern of movable rows or groups of desks. There was some between-class variability in both class size and the flexibility of or changes made in the seating pattern during observation periods. For example, some classes made no seating pattern changes, while others made one or more during each observation period. However, neither of these variables showed any relationships to any other classroom or student variables.

The one physical classroom characteristic that showed both between-class variability and relationships to other variables in the study was noise level. For example, using a four-point scale, three of the classes were rated as "quiet" (1.0) for all five observations, while one was rated as "very noisy with disruptions" (4.0) for all five observations. The overall mean for noise level was 2.4 (see Table 3).

Grouping structure. Analyses of the classroom grouping structure information collected in Part II of the observation instrument yielded interesting and significant results, as also shown in Table 3. The final variables used in these analyses included the following:

1. WT = percent of total observation time during which students interacting with the teacher could be observed. The value of this variable was designed to be 50 percent in all classrooms. Differences in actual grouping structure, however, created some variability in this variable.

2. IND = percent of total observation time during which the grouping structure included individual students working alone (i.e., doing seatwork) or, in a few instances, individual students interacting with the teacher (i.e., a 1:1 ratio).

Table 3

Descriptive Results on Salient Classroom Observation Variables (Parts I and II) by Class

Class	n[a]	Grade	Noise[b] level	Grouping structure					Teacher behavior		Teacher verbal behavior about subject matter			Student task choice	Student task absorption		
				WT	IND	TOT	GP	OTHR	NOT	INTER	TELL	QUEST	MAINT	NO CHOICE	OFF	ROU	MOD
1	22.8	4	1.4	50	98	2	84	50	14		8	38	55	0	6	34	60
2	23.6	4	4.0	44	82	20	52	56	20		32	29	38	72	26	44	24
3	20.8	4-5	1.4	36	100	4	60	32	34		16	46	38	61	4	30	64
4	23.2	5	1.0	46	100	0	82	38	6		5	48	47	56	0	28	70
5	21.6	5	1.0	68	60	40	52	28	0		17	50	33	27	2	40	56
6	23.8	6	2.8	58	78	22	82	0	0		15	50	35	38	8	30	62
7	15.8	5	1.8	46	94	4	74	24	20		28	38	34	75	8	34	52
8	20.6	4	1.8	42	96	4	74	6	14		13	43	43	100	6	42	52
9	21.8	5	2.8	44	88	12	64	6	12		16	44	41	36	28	34	38
10	16.4	4	1.2	68	42	58	10	22	12		25	42	33	73	10	64	24
11	18.8	4	1.8	54	82	18	60	20	22		24	59	18	83	10	78	8
12	21.0	6	1.0	60	80	20	80	0	0		26	59	15	100	12	68	20
13	18.6	4	2.4	60	70	30	44	18	26		31	26	43	95	20	68	12
14	21.2	6	3.8	54	80	20	58	24	16		28	69	3	100	34	66	0
15	21.0	5	1.2	42	98	2	66	6	40		39	42	19	92	8	66	26
16	22.6	5	1.8	66	46	58	26	14	10		15	47	38	100	20	50	28
17	20.4	5	1.4	58	76	24	72	6	8		9	51	40	100	10	46	44
18	16.4	5-6	2.4	58	76	24	74	22	20		27	49	24	100	30	40	30
19	22.8	5	1.2	68	38	60	18	24	24		22	48	30	100	6	54	34
20	23.8	5-6	1.6	30	82	18	26	42	70		13	35	52	100	24	40	36
21	23.2	5-6	1.6	38	92	8	66	24	38		19	50	31	87	10	50	40
Total	21.0		2.4	52	79	21	58	22	19		20	46	34	76	13	48	37

[a] n = Average class size during observations.
[b] Four-part scale, where 1 = quiet and 4 = noisy with disruptions.

3. TOT = percent of total observation time during which the grouping structure involved the whole class interacting with the teacher.

4. GP = percent of total observation time during which the grouping structure included small groups of students interacting with the teacher.

5. OTHR = percent of total observation time during which the grouping structure included such other arrangements as structured small groups working without the teacher (i.e., given a task to do together) and unstructured groups or individuals without the teacher (e.g., free time).

The grouping structure results shown in Table 3 reveal four different types of classrooms. The first type (classes #10, 16, and 19), with a relatively high percent of WT and TOT and a relatively low percent of GP, could be characterized as relying relatively more on total group instruction. The second type (classes #1, 3, 4, 7, 8, 15 and 21), with a relatively low percent of WT and TOT and a relatively high percent of IND, GP, and OTHR, could be characterized as using a varied grouping structure, including different kinds of individual and small group work but excluding total group instruction. In the third type (classes #6, 9, 11, 12, 14, 17, and 18), percents for WT were moderate (close to 50 percent), percents for IND and GP were relatively high (but not as high as classes of the second type), percents for TOT were moderate (close to the overall mean percent for TOT), and percents for OTHR were generally low. These classes could thus be characterized as using a combination of primarily individual and small group instruction, but also using total group instruction to an observable degree. The grouping structure in final type of classes (#2, 5, 13, and 20) can be characterized primarily by its variability or by the relatively even distribution of IND, TOT, GP, and/or OTHR percents observed.

This clustering of classes by grouping structure was retained throughout the analyses of classroom data. However, none of the other classroom characteristics showed the same clustering.

Teacher behavior when not interacting with small/large group. From its initial observation as five discrete behaviors, this variable was collapsed into two categories: (a) interacting with students on the teacher's initiative (e.g., moving around the classroom while discussing or monitoring individual seatwork) and (b) not interacting with students except on student's initiative (e.g., grading papers or answering students' questions). Given the predominance of small and large group instruction in all classes observed, the frequencies for these two aggregated variables were quite low. For "teacher interacting," the mean was 9 percent of total observation time and the range was 0 to 24 percent. For "teacher not interacting," (NOT INTER, see Table 3) the mean was 19 percent, the median was 16 percent, and the range was 0 to 40 percent with one outlier (class #20) at 70 percent.

Teacher verbal behavior. During observations of students with the teacher (WT), several aspects of teacher verbal behavior were coded, including audience (whole class, small group, individual) and content (subject matter, further coded as telling, questioning, or maintaining activity; routine classroom procedures; student behavior). The results for these variables were aggregated as percents of relevant observation time (e.g., the total time "audience for teacher verbal behavior" was coded served as the denominator for the three audience variables).

The results for these variables included several interesting patterns. First, as might have been expected, the results for audience were highly correlated with the grouping structure and thus provided no

new information. Second, very little of this sample of teachers' verbal behavior was focused on content other than the subject matter. Observed instances of teacher talk about routine classroom business or procedures averaged 7 percent and ranged from 0 to 12 percent, with class #20 again an outlier at 33 percent. Instances of teacher talk about student behavior averaged 8 percent, with a median of 4 percent and a range of 0 to 43 percent. These results are, in part, probably a function of the research design. All observations were conducted within an instructional period, thus excluding most transition times between periods when teacher talk about routine class procedures may be more prominent. Also, all observations of teacher verbal behavior were conducted during direct interactions with students, thus excluding teacher verbal behavior when not directly interacting with students (a substantial proportion of observed time in several classes). These design limitations should be remedied in future research of this kind. Nonetheless, these results do imply that this sample of teachers' direct interactions with students were largely focused on subject matter concerns.

Finally, within subject matter, teacher verbalizations were further coded as telling (imparting information), questioning, or maintaining the activity (e.g., asking the next student to read aloud or asking all student to look at page x). The results for these three variables shown in Table 3 indicated that, on the average, when talking about the subject matter, these teachers asked questions 46 percent of the time, imparted information 20 percent of the time, and maintained the activity 34 percent of the time. These results also reveal considerable between class variability.

Student behavior. The design of the observation instrument called for observations of randomly identified individual students both interacting and not interacting with the teacher. For each student observation, the following variables were coded: assigned task (using the same categories as the grouping structure variable), degree of choice in assigned task, and level of task absorption. An extensive series of analyses with the multiple variables created by this observation scheme (e.g., task absorption in small groups interacting with the teacher) revealed many differences in frequency, for example:

1. During observations of students with the teacher, the assigned task was small group work 58 percent of the time, total group instruction 40 percent of the time, and individual student with the teacher 2 percent of the time. For all observations of students without the teacher, the student's task was individual assigned work.

2. Students observed with the teacher had virtually no choice about their assigned task, while 24 percent of the students observed without the teacher had limited choice about their task. The range by class for this latter variable was 0 to 100 percent. Table 3 presents class-level data on the percent of students observed without the teacher who had no choice over their task, see NO CHOICE. (There were no observations when student choice was coded as "complete.")

3. The student task absorption variable was aggregated at three levels: off-task and routine or moderate absorption. Most (86 percent) of the small number of students observed in individual interaction with their teacher were routinely absorbed in the activity. Contrasting students observed in small group versus total group interaction with their teacher, 4 vs. 12 percent were off-task, 47 vs. 65 percent were routinely absorbed, and 50 vs. 23 percent were moderately absorbed in the

task. Finally, task absorption for students observed without the teacher was more variable: 21 percent were off-task, 42 percent were routinely absorbed, and 38 percent were moderately absorbed.

However, because the correlational patterns for these discrete task absorption variables were similar, they were aggregated across task and setting, with the results shown in Table 3. These results show that on the average, students were off-task 13 percent of the time, routinely absorbed 48 percent of the time, and moderately absorbed 37 percent of the time, again with considerable between-class variability.

Classroom climate: Observer perceptions. Using means by class (calculated across the five observation times), a principal axis factor analysis with promax rotation on the observers' classroom climate perceptions (Part III of the observation instrument) yielded two factors accounting for 84.1 percent of the variance, as shown in Table 4. The two factors were labelled (a) task orientation, with major loadings for rule clarity, rule enforcement, instructional order and organization, task orientation, and interest/attention, and (b) affect, with major loadings for noninstructional order and organization (negative loading), affect, affiliation, and choice. The correlation between the two factors was .36. Factor scores generated for each class from this analysis are presented in Table 5.

Classroom climate: Student and teacher perceptions. The final source of quantitative classroom data came from the climate instrument completed by both students and teachers. Because factor analyses of these data generally supported the original five dimensions measured, these dimensions were retained. Both the student and teacher scores, however, were standardized and a difference score derived for each class by subtracting the teacher score from the class mean. The results of these analyses are presented in Table 6.

Table 4

Results of a Principal Axis Factor Analysis with Promax Rotation on Observers' Climate Perceptions

Variable	Factor loadings: Factor 1 (Task orientation)	Factor loadings: Factor 2 (Affect)	h^2
Rule clarity	.92	.11	.93
Rule enforcement	.84	.19	.86
Noninstructional order and organization	.01	-.06	.43
Instructional order and organization	.92	-.11	.79
Individualization	-.16	.34	.17
Task orientation	.91	-.50	.80
Interest/attention	.78	.36	.93
Affect	.09	.90	.88
Affiliation	.20	.85	.88
Choice	-.03	.60	.34

Table 5

Observer Climate Factor Scores by Class

Class	Task orientation	Affect
1	2.1	5.1
2	-5.0	-1.6
3	2.0	1.5
4	5.4	2.2
5	4.3	-4.1
6	2.7	3.6
7	0.6	3.3
8	3.9	-5.9
9	-5.6	0.3
10	1.5	3.7
11	-0.8	-0.1
12	3.9	-0.1
13	0.8	1.8
14	-10.7	-3.3
15	0.7	2.5
16	-4.7	-4.0
17	1.5	2.0
18	-4.4	-4.0
19	2.4	0.4
20	-1.8	-1.9
21	1.2	-1.3

Table 6

Standardized Student (Class Means), Teacher, and Difference Climate Scores by Class

Class	Involvement			Task orientation			Order and organ.			Rule clarity			Innovation		
	$\bar{X}_{St}$	Tchr	Diff[a]	$\bar{X}_{St}$	Tchr	Diff	$\bar{X}_{St}$	Tchr	Diff	$\bar{X}_{St}$	Tchr	Diff	$\bar{X}_{St}$	Tchr	Diff
1	1.0	0.6	0.5	0.5	0.9	-0.4	1.3	1.4	-0.0	0.6	0.9	-0.3	0.6	0.8	-0.2
2	-0.2	0.6	-0.7	-0.2	-1.2	1.0	-0.6	-0.4	-0.2	-0.3	0.9	-1.2	-0.4	-0.1	-0.3
3	0.5	1.4	-1.9	0.8	0.9	-0.1	0.8	1.4	-0.6	0.2	0.9	-0.7	0.0	-1.4	1.5
4	1.0	-0.2	1.2	0.4	-0.5	0.8	0.9	-0.1	1.0	0.7	-0.4	1.1	0.7	1.3	-0.6
5	-0.7	-1.9	1.2	-0.6	0.9	-1.5	-0.8	-0.8	-0.0	-0.0	-0.4	0.4	-0.3	0.8	-1.1
6	0.1	0.2	-0.1	-0.7	0.9	-1.6	-0.4	-0.4	0.0	-0.0	-1.7	1.7	0.5	0.1	0.4
7	-0.1	0.6	-0.7	0.0	-0.5	0.5	0.0	0.7	-0.7	0.1	0.9	-0.8	-0.0	-0.5	0.5
8	-0.0	-0.7	0.6	-0.2	-1.2	1.0	-0.1	0.7	-0.7	0.1	0.3	-0.2	-0.3	-0.3	-0.0
9	-0.9	0.2	-1.1	-0.1	-0.5	0.3	-0.8	-0.4	-0.4	-0.1	-0.4	0.3	-0.3	1.7	-2.0
10	0.3	-0.2	0.5	0.3	-0.5	0.8	0.5	0.7	-0.2	-0.2	0.9	-1.1	0.6	0.8	-0.2
11	0.2	0.6	-0.4	0.1	0.9	-0.8	0.0	0.7	-0.6	0.2	0.9	-0.7	0.5	0.4	0.2
12	0.3	1.0	-0.7	0.4	1.3	-0.8	0.6	1.0	-0.4	0.6	0.3	0.3	-1.1	0.1	-1.2
13	-0.1	0.6	-0.7	0.3	1.6	-1.3	-0.3	-1.1	0.9	-0.6	0.9	-1.5	-0.8	-1.4	0.7
14	-1.2	0.6	-1.7	-1.5	-0.5	-1.0	-1.3	-1.5	0.2	-0.9	-2.4	1.4	-0.2	0.8	-1.0
15	-0.8	-0.2	-0.6	0.4	-0.5	0.8	-0.4	0.7	-1.1	-0.5	-0.4	-0.0	-0.4	-0.5	0.1
16	-0.3	-1.6	0.7	-0.1	0.9	-1.0	-0.3	0.7	-0.9	-0.1	0.9	-1.0	-0.0	-0.5	0.5
17	0.5	1.4	-0.9	0.7	0.2	0.5	-0.1	-1.5	1.4	0.6	-0.4	1.0	0.6	1.7	-1.1
18	-0.2	-1.9	1.7	-0.7	-2.5	1.8	-0.7	-2.2	1.5	-0.4	-1.7	1.4	0.1	-0.1	0.2
19	0.3	0.6	-0.3	0.1	0.2	-0.1	0.7	0.7	0.0	-0.0	-0.4	0.4	-0.0	-0.5	0.5
20	0.1	-0.2	0.4	0.1	-0.5	0.6	0.3	-0.8	1.1	0.0	-0.4	0.4	0.2	-1.9	2.0
21	0.2	-1.9	2.1	0.2	-0.5	0.6	0.0	0.7	-0.6	-0.1	0.9	-1.0	0.1	-1.0	1.0

[a] Class mean minus teacher score, before rounding.

Earlier descriptive results on the raw student climate data (analyzing by student, before standardizing) yielded relatively moderate mean scores (i.e., 5 on a 10-point scale) for involvement, innovation, and order and organization and relatively high mean scores (i.e., 7 on a 10-point scale) for rule clarity and task orientation. Raw teacher means were substantially higher, ranging from 5.2 for innovation to 9.3 for rule clarity.

Correlational Results

In the next phase of the data analysis, relationships among these various classroom characteristics were assessed, with the results shown in Tables 7-9.

Observation variables. Table 7 presents intercorrelations among the salient classroom observation variables (the same variables displayed in Tables 3 and 5). These results reveal the following interrelationships or clustering of variables.

1. Proportion of off-task student behavior is positively related to noise level and negatively related to the task orientation dimension of observers' climate perceptions. That is, noisier classrooms were perceived by the observers to be less task oriented and to have a higher frequency of off-task student behavior.

2. Within the grouping variables, individual work and total group instruction show a near perfect inverse relationship with each other, as well as strong relationships with both small group work and overall percent of time during which students interacting with the teacher could be observed (WT). That is, classrooms with a relatively high percent of WT tended also to have a relatively high frequency of total group

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Table 7

Intercorrelations Among Salient Classroom Variables from Observation Instrument

	Phys Char	Grouping				Teacher Behavior	Teacher verbal behavior			Student behavior				Observer climate perceptions		
	NOISE	WT	IND	TOT	GP	OTHR	NOT INTER	TELL	QUEST	MAINT	NO CHOICE	OFF	ROU	MOD	TASK ORIENT	AFFECT
NOISE		-.12	.08	-.06	.06	.12	-.03	.34	-.04	-.21	.04	.75**	-.00	-.39	-.76**	-.24
WT			-.80**	.80**	-.31	.30	-.65**	.10	.26	-.28	.02	-.06	.35	-.26	.08	-.01
IND				-.99**	.78**	.12	.21	-.12	-.07	.14	-.23	-.12	-.34	.35	.09	.17
TOT					.73**	-.11	-.21	.11	.06	.13	.23	.13	.33	-.35	-.11	-.18
GP						-.17	-.34	-.19	.21	-.03	-.32	-.20	-.34	.40	.21	.16
OTHR							.33	-.11	-.29	.38	-.31	.05	-.29	.15	-.11	.04
NOT INTER								.19	-.35	.14	.35	.21	.08	-.16	-.18	-.05
TELL									.10	-.62**	.40	.36	.61**	-.68**	-.34	-.03
QUEST										-.71**	.16	.00	.27	-.19	-.15	-.26
MAINT											-.41	-.25	-.64**	.63**	.35	.22
NO CHOICE												.33	.54*	-.59**	-.24	-.42
OFF													.19	-.64**	-.91**	-.40
ROU														-.87**	-.18	-.08
MOD															.60**	.26
TASK ORIENT																.36
AFFECT																

* p < .05
** p < .01

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instruction; and the higher the frequency of total group instruction, the lower the frequency of both individual work and small group instruction.

3. The frequency with which teachers were observed not interacting with a small or large group or with individual students except on the student's initiative (NOT INTER) was negatively correlated only with WT. Because WT represents direct student-teacher interactions, this is a logical relationship but not particularly meaningful.

4. Within teacher verbalizations about the subject matter, the frequency of telling and questioning were not related, yet both were negatively related to frequency of maintaining activity. In addition, telling and maintaining showed opposite relationships with student task absorption levels. That is, the more often teacher subject matter talk served to maintain the activity, the less often teacher subject matter talk consisted of information or questions, and the higher the level of moderate (vs. routine) student task absorption. Conversely, the more often teacher subject matter talk consisted of telling or imparting information, the higher the level of routine (vs. moderate) student task absorption.

This pattern of results brings to mind recent literature on teaching (e.g., Brophy, Note 2) regarding the use of predictable vs. random or unpredictable teacher strategies for calling on students. This literature suggests that predictable strategies (e.g., going around a reading group in order) are more successful (in terms of student achievement) than unpredictable strategies. While clearly speculative, the results of the present study may be consistent with this literature. That is, <u>if</u> teacher verbalizations designed to maintain the activity could be interpreted as use of a predictable strategy for calling on students, then these results suggest that this strategy is positively related to student

task absorption (and again, by inference, perhaps also to student achievement). Using the same speculative reasoning, however, the results of this study are not consistent with the same teacher literature in the area of lecturing or imparting information. This literature suggests that use of this element of direct instruction is positively related to teaching effectiveness. In this study, use of teacher telling showed a negative relationship to moderate student task absorption and a positive relationship to routine student task absorption.

5. Finally, the results for student behavior show predictable negative relationships between frequency of moderate task absorption and both routine and off-task frequencies. In addition, student task absorption shows a positive relationship to degree of choice over task; students were more absorbed when they had some vs. no choice over their task.

Student/teacher climate perceptions. The intercorrelations among standardized student and teacher climate variables presented in Table 8 show the following:

1. Average student perceptions of climate dimensions are highly intercorrelated, except for the dimension of innovation. (The pattern of relationships shown in Table 8 is similar to intercorrelations derived from individual student scores, rather than class means. The class-level correlations, however, are substantially stronger.) Average student perceptions of climate dimensions are also positively related to teacher perceptions, again except for innovation, though few of these relationships reach statistical significance. In general, average student perceptions are not related to differences in student/teacher perceptions.

2. Interrelationships among teacher climate perceptions are generally positive, except for innovation, but not statistically

Table 8

Intercorrelations Among Student and Teacher Classroom Climate Variables

	Student climate perceptions (class means)					Teacher climate perceptions					S/T differences in climate perceptions				
	INVOLV	TASKO	O+O	RULE CL	INNOV	INVOLV	TASKO	O+O	RULE CL	INNOV	INVOLV	TASKO	O+O	RULE CL	INNOV
(S) INVOLV		.66**	.87**	.78**	.52*	.28	.22	.39	.39	-.01	.29	.14	.24	-.08	.26
TASKO			.75**	.64**	.12	.39	.36	.54*	.68**	-.14	-.02	.18	-.07	-.45*	.21
O+O				.73**	.34	.32	.31	.66**	.50*	.14	.18	.10	-.01	.22	.31
RULE CL					.37	.27	.27	.41	.32	.29	.18	.07	.08	.09	-.12
INNOV						.00	-.09	.03	-.06	.33	.29	.16	.26	.22	.15
(T) INVOLV							.40	.20	.14	.09	-.84**	-.20	.01	-.04	-.10
TASKO								.36	.33	-.07	-.28	-.85**	-.21	-.23	.03
O+O									.66**	-.20	.03	-.07	-.76**	-.52*	.23
RULE CL										-.29	.08	.04	-.44*	-.92**	.27
INNOV											-.09	-.01	.15	.43	-.88**
(D) INVOLV												.28	.13	-.01	.25
TASKO													.18	-.01	.09
O+O														.50*	-.03
RULE CL															-.34
INNOV															

* p < .05
** p < .01

significant. These teacher scores, however, do show strong negative relationships with student/teacher difference scores on the same dimension. That is, more positive teacher perceptions are associated with larger negative discrepancies between student/teacher perceptions in which teacher perceptions are more positive.

Relationships between observation variables and student/teacher climate perceptions. Finally, Table 9 displays the correlations between the observation and climate variables. These results reveal the following:

1. Although perceptions of classroom innovation were not related to other climate perceptions, they do show a few relationships to observation variables. Average student perceptions of innovation were lower in classes with higher frequencies of teacher telling. Teachers with higher observed frequencies of not interacting with any students except on student initiative tended to have lower perceptions of innovation in their classrooms and a larger discrepancy between their own and their students' perceptions, with those of students higher.

2. Average student climate perceptions, though not related to grouping structure, were more positive in quiet than noisy classrooms, in classrooms with higher amounts of teacher talk designed to maintain the activity and lower amounts of teacher telling, and in classrooms with higher observed amounts of moderate student task absorption and lower observed amounts of off-task student behavior.

3. Neither teacher perceptions nor student/teacher differences in perceptions of climate showed consistent or large relationships with observation variables.

4. Among the more interesting results was that observer climate perceptions showed stronger positive relationships with average student than with teacher climate perceptions.

Table 9

Correlations Between Salient Classroom Observation Variables and Student/Teacher Climate Variables

Observation variables	Student climate perceptions					Teacher climate perceptions					S/T differences in climate perceptions				
	INVOLV	TASKO	O+O	RULE CL	INNOV	INVOLV	TASKO	O+O	RULE CL	INNOV	INVOLV	TASKO	O+O	RULE CL	INNOV
NOISE	-.49*	-.64**	-.66**	-.61**	-.18	.11	-.30	-.49*	-.32	-.06	-.39	-.04	.08	.08	-.14
AT	-.07	-.20	-.12	-.07	.01	-.08	.33	-.16	-.12	.35	.04	-.46*	.11	.10	-.36
IND	.15	.17	.11	.23	-.01	.17	-.18	.14	.02	-.03	-.08	.29	-.09	.07	.03
TOT	-.15	-.16	-.11	-.24	.01	-.17	.20	-.13	-.00	.01	.08	-.29	.07	-.10	-.01
SP	.18	-.01	.00	.36	.02	.09	-.07	-.02	-.20	.31	.01	.06	.03	.37	-.32
THR	.31	.07	.31	.06	.25	-.01	-.17	.04	.26	-.15	.18	.21	.21	-.25	.29
OT INTER	-.04	.20	.10	-.26	-.04	-.04	-.22	.03	.13	-.71**	.02	.34	.05	-.25	.73**
TELL	-.54*	-.24	-.44*	-.68**	-.55**	.03	-.17	-.09	.00	-.31	-.34	.05	-.25	-.29	.04
QUEST	-.15	-.37	-.19	.04	.12	-.02	.07	-.05	-.49*	.39	-.07	-.28	-.09	.53*	-.35
MAINT	.50*	.46*	.45*	.45*	.30	-.01	.07	.11	.38	-.09	.29	.19	.25	-.21	.24
NO CHOICE	-.19	-.04	-.20	-.31	-.33	.00	-.26	-.21	-.08	-.41	-.11	.25	.10	-.05	.27
OFF	-.56**	-.54*	-.62**	-.62**	-.30	-.06	-.38	-.60**	-.35	-.04	-.26	.11	.26	.11	-.11
ROU	-.25	-.02	-.17	-.37	-.33	.13	.22	.04	.12	-.08	-.27	-.24	-.20	-.28	-.08
MOD	.47*	.28	.43*	.59**	.39	-.09	.03	.25	.05	.09	.36	.13	.05	.20	.10
TASK ORIENT	.63**	.57**	.64**	.64**	.13	.01	.36	.45*	.31	-.04	.34	-.06	-.04	-.06	.11
AFFECT	.48*	.54*	.51*	.34	.38	.54*	.35	.33	.23	.16	-.27	-.07	.01	-.10	.03

* $p < .05$
** $p < .01$

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Summary

Beyond such design factors as grade level (4-6) and observed instructional area (reading/language arts) and such demographic characteristics as physical space and seating pattern, the 21 classrooms participating in this research study showed considerable variability on a number of measured dimensions. In addition, these dimensions showed a number of interesting interrelationships.

Grouping structure was one salient classroom dimension. In three classes, total group instruction appeared to be the dominant structure (occurring close to 60 percent of observed time). These classes also had the lowest frequencies of individual student work, reflecting the nearly perfect inverse relationship found between use of total group instruction and individual student work. Another seven classes could be characterized as using a variety of individual and small group work arrangements to the exclusion of large group instruction. A third cluster of seven classes relied on more conventional individual and small group arrangements (e.g., individual seatwork and small group working with the teacher) and also used total group instruction to an observable degree (approximately 20 percent of observed time). These latter two clusters of classrooms reflect the negative relationships found between frequency of large group instruction and both individual and small group frequencies. The grouping structure in the final cluster of four classrooms can be characterized primarily by its variability.

Also observed was teacher behavior when not interacting with a small or large group. Given the predominance of small and large group instruction in all classes observed, the frequencies for this category of teacher behavior were quite low. More specifically, when not involved in group work, the teachers in this sample spent very little time interacting with

students on the teacher's initiative (e.g., moving around the classroom and discussing or monitoring individual seatwork). More time and more class-to-class variability was observed for teachers not interacting with students except on the student's initiative (e.g., grading papers or answering student questions). Teachers with higher frequencies on this latter variable had lower frequencies of overall interaction time with students and also had lower perceptions of the degree of innovation in their classrooms.

Observations of teachers' verbal behavior during interactions with students indicated that these interactions were largely focused on subject matter concerns, rather than routine classroom procedures or student behavior. Within subject matter verbalizations, these teachers, on the average, asked questions 46 percent of the time, imparted information 20 percent of the time, and maintained the activity 34 percent of the time. Higher frequencies of teacher subject matter talk designed to maintain the activity were associated with lower frequencies of both questioning and telling, higher student task absorption levels, and more positive student perceptions of classroom climate (except for innovation). Conversely, higher frequencies of teacher subject matter talk designed to impart information (telling) were associated with lower levels of student task absorption and with more negative student perceptions of classroom climate, including innovation.

Level of student task absorption was further negatively related to the noise level in the classroom, positively related to degree of choice students had over the learning task, and positively related to average student climate perceptions and to observers' perceptions of the overall task orientation of the classroom.

Finally, student and teacher climate perceptions showed positive, but generally nonsignificant relationships. Observer climate perceptions were more strongly related to average student than to teacher perceptions.

This characterization of this sample of elementary school classrooms generates the following questions within the larger framework of this research study:

1. Is the observed between-class variability in grouping structure related to either class averages or within-class variability in the measured student characteristics?

2. What hypotheses can be generated for the differential relationships found for teacher subject matter talk designed to maintain the activity vs. impart information? Why does the former show positive and the latter show negative relationships with student task absorption and climate perceptions?

3. What are the relationships between climate perceptions (student, teacher, observer) and within-class student characteristics? Are student (and observer) climate perceptions based largely on classroom activities, while teacher climate perceptions show stronger relationships to student characteristics? (Student climate perceptions showed a number of relationships to measured classroom activities, while teacher climate perceptions did not.)

Answers to these and other questions were sought through a series of correlational and multivariate analyses, the results of which are reported in the next section.

Relationships Between Student and Classroom Variables

Theoretical Frameworks

Explorations of the relationships between the salient student and classroom characteristics found in this study were conducted within two complementary theoretical frameworks. First, from ATI research, comes the importance of considering three different levels of analysis: (1) pooled analyses using students as the unit of analysis and thus "ignoring" class membership; (2) within-class analyses, again using

students as the unit of analysis but also taking class membership into account; and (3) between-class analyses, using classes as the unit of analysis and thus "ignoring" within-class variability. Previous ATI research has suggested that the relationships among student characteristics (or aptitudes), instructional characteristics (or treatments), and learning are different at these different levels of analysis.

Secondly, from ATI and many other areas of educational research come questions about causality in conceptual efforts to link non-cognitive (specifically motivational) student characteristics with instructional characteristics and student learning. For example, the direction of causality in the self-concept-achievement relationship remains a topic of considerable empirical interest (Shavelson & Bolus, 1982). In the present study, no assumptions were made about the direction of causality in exploring relationships. Rather, most sets of variables were considered as both independent and dependent variables in the analyses. This stance was adopted as the one most consistent with the beliefs of the researcher and with the nature of the data collected. These data, and their conceptualization within these two theoretical frameworks, are discussed next.

Sets of Variables Included

Analyses of the relationships between student and classroom characteristics were conducted on the following sets of variables, which had been identified in the separate analyses of student and classroom data:

1. Student demographic characteristics - community, grade level, sex, socioeconomic status (SES)
2. Student motivational characteristics - ability and effort motivational orientations

3. Student achievement - achievement

4. Classroom characterisitcs - grouping structure (WT, IND, GP, OTHR); teacher behavior (NOT INTER); teacher subject matter verbalizations (TELL, MAINT); student task absorption (OFF, MOD)[4]

5. Student perceptions of classroom climate - five dimensions (involvement, task orientation, order and organization, rule clarity, innovation)

6. Teacher perceptions of classroom climate - same five dimensions

7. Observer perceptions of classroom climate - task orientation, affect (derived from factor analyses)

These analyses explored interrelationships among all sets of variables at each of the three levels recommended by ATI research: pooled across students, within-class, and between class.

However, given the conceptual nature of these variables in the present study (and the ways in which they were measured), there are several additional substantive considerations relevant to these analyses and their interpretations. First, all student variables are intended to represent general academic rather than task- or situation-specific (i.e., classroom-specific) characteristics of learners and learning environments. This is particularly true for student achievement, which was measured by a combination of past and current indices. Though also true for student motivational characteristics, these latter characteristics may be more closely tied to the particular classroom a student was in during the study. This is because many of the motivational measures directly or indirectly referenced the student's classroom when asking about expectations, causal beliefs, self-perceptions, etc. Second, the classroom characteristics measured in this study are viewed as the "treatment" within the ATI framework. As discussed below, this multifaceted, class-based conceptualization of "treatment," though conceptually sound, led to a number of statistical

complications. Finally, climate perceptions are considered separately from observed classroom characteristics primarily because climate research has suggested that "the actual behavior is less important than perceived behavior because perception is what controls one's responses" (Anderson, 1982, 387).

Sets of Analyses Conducted

To date, three sets of analyses have been conducted exploring the relationships between student and classroom variables: simple correlations, multiple regressions on achievement, and canonical correlations. Within each set, analyses at each of the three ATI levels of analysis were attempted. These multi-tiered analyses, however, were complicated by the nature of the "treatment" data collected in this study. More specifically, in typical ATI research, "treatment" is a "Yes/No" or "T1/T2/T3" type of variable which cuts across class membership and can be represented by dummy coding (independent of "class") in regression and other multivariate analyses. In the present study of "naturally occurring ATI," however, "treatment" was defined as the salient classroom characteristics measured. It is thus coincident with the "class" variable and must be represented in multivariate analyses by the set of discrete classroom variables identified. That is, in typical ATI research, treatment represents instructional strategies that are independent of class, while treatment in this study equals class.[5]

This treatment definition had different analysis implications at each of the three levels of analysis. First, for the pooled analyses, treatment or classroom information was replicated by student. That is, in these analyses each student had his/her individual scores on the student-level variables and his/her classroom scores on the

classroom-level variables. Second, treatment or classroom information could not be directly included in the within-class analyses. These analyses addressed questions about the scope and effects of within-class variability. Yet, by definition, there was no within-class variability on the treatment variable. Finally, the between-class analyses were affected by the relatively large number of variables used to represent treatment in this study. The sample size for these analyses was only 21 and the number of variables of interest was of a similar magnitude, thus leading to problems with limited degrees of freedom.

Within this context then, of both theory and statistical analyses, the remainder of this section presents the relationships found between the salient student and classroom variables identified in this study.

Correlational Results

Student-level (pooled) results. For the pooled level of analysis, the only classroom data collected by student are student climate perceptions. The correlations between these perceptions and student motivational and achievement characteristics, shown in Table 10, include positive but weak relationships between climate perceptions and motivational orientations, but virtually no relationships between climate perceptions and achievement. This pattern of results may, in part, reflect the closer measurement linkages between the particular classroom students were in during the study and their motivational characteristics than between this particular classroom and the students' achievement characteristics. At the same time, climate and motivation both represent internal subjective student perceptions, while achievement represents external objective and subjective assessments.

Table 10

Student-Level Correlations Between Student and Classroom Variables
(n = 396)

Student climate perceptions	Student variables		
	Ability orient.	Effort orient.	Achievement
Involvement	.21**	.38**	.00
Task orientation	.18**	.20**	.15**
Order and organization	.19**	.28**	.03
Rule clarity	.17**	.27**	.09
Innovation	.02	.17**	-.10

* $p < .05$
** $p < .01$

Classroom-level (between-class) results. Table 11 presents class-level correlations between student and classroom characteristics. These results include few relationships between instructionally-related classroom characteristics and average student characteristics, suggesting that these teachers did not base these kinds of instructional decisions on the average motivational or achievement profile of students in their class. The results also include mixed relationships between average student characteristics and student task absorption. Routine task absorption was characteristic of classes with high average effort orientation, while moderate task absorption was somewhat characteristic of classes with low average effort orientation. Average class achievement, on the other hand, showed a more linear and direct relationship to student task absorption.

Interestingly, the between-class relationships between student characteristics and student climate perceptions showed a pattern very different from the pooled relationships. In the latter, climate perceptions showed stronger relationships to motivation than to achievement, while in the former, links between climate perceptions and achievement were stronger than those between climate perceptions and

Table 11

Classroom-Level Correlations Between Student and Classroom Variables
(n = 21)

Classroom variables		Student variables (class means) Ability orientation	Effort orientation	Achievement
Observed characteristics				
Grouping:	WT	-.07	.01	-.03
	IND	.08	-.04	-.01
	GP	-.02	-.18	-.09
	OTHR	.20	-.12	.07
Teacher:	NOT INTER	.32	.24	-.02
Teacher verbal beh:	TELL	-.15	.17	-.22
	MAINT	.10	-.17	.32
Student task absorption:	OFF	-.22	-.16	-.42
	ROU	.13	.61**	-.08
	MOD	.03	-.38	.26
Student climate perceptions (class means)				
Involvement		.36	.14	.61**
Task orientation		.41	.47*	.49*
Order and organization		.37	.21	.63**
Rule clarity		.13	.02	.39
Innovation		.10	-.19	.33
Teacher climate perceptions				
Involvement		.04	.47*	.33
Task orientation		.53*	.66**	.03
Order and organization		.13	.25	.51*
Rule clarity		.20	.30	.49*
Innovation		-.35	-.24	-.11
Observer climate perceptions				
Task orientation		.20	.14	.41
Affect		.22	.26	.34

* $p < .05$
** $p < .01$

motivation. That is, assuming a causal framework for the moment, an individual student's climate perceptions were not influenced by his/her own achievement level but were influenced by the average level of his/her classmates, while these climate perceptions were influenced both by the individual student's motivational characteristics and by those of his/her classmates (though the latter non-significantly).

Finally, teacher climate perceptions do show some relationships to average student characteristics. Higher teacher perceptions of involvement are linked with higher average effort orientation classes, of task orientation with higher average ability and effort orientation classes, and of order and organization and rule clarity with higher average achievement classes. In conjunction with earlier results (e.g., see Tables 9 and 10), these results suggest that teacher climate perceptions are not linked to instructionally-related classroom characteristics, but are linked to average student characteristics. Student climate perceptions, on the other hand, are linked to both classroom characteristics and motivational and achievement charateristics of their classmates.

Regression Results

The next series of analyses explored the interrelationships among the selected sets of student and classroom characteristics through regression analyses on achievement. In interpreting these analyses, it should be recalled that achievement in this study represents students' general academic performance, including their performance in the particular classrooms observed, but not limited to it. All regression analyses used effect coding (Kerlinger & Pedhauzer, 1973) to represent the categorical variables of community, grade level, sex, SES, and class, and pairwise

deletion for missing data. In all stepwise analyses, demographic characteristics were entered first, followed by motivational aptitudes, then classroom characteristics (or treatment variables), and finally any interaction terms.

Student-level (pooled) results. The key regression results from the pooled analyses are shown in Table 12. These results reflect the use of both a forward, stepwise procedure and a backwards, step-down procedure as recommended in ATI studies (see Corno, Mitman, & Hedges 1981, and Janicki & Peterson, 1981). As revealed in previous analyses, these results indicate that across students, achievement is related to ability orientation, sex, and SES, but not to effort orientation or climate

Table 12

Student-Level (Pooled) Regression Results on Achievement

	Step-wise procedure				Step-down procedure	
Variable	R	R^2	R^2 Change	F (for change)	R^2 change if deleted	F
Community					.00	1.27
Grade level					.00	0.97
Sex					.02	12.95**
SES	.42	.18	.18	8.91**	.02	4.15**
Ability orientation	.68	.46	.28	196.61**	.15	125.90**
Effort orientation	.68	.46	.00	0.00	.00	2.93
Student climate perceptions	.69	.47	.01	2.14	.01	1.96
Class	.74	.55	.08	3.14**	.08	3.75**
Ability orientation x class	.76	.58	.03	1.52	.04	1.84*
Effort orientation x class	.80	.63	.05	2.04**	.05	2.04**

* $p < .05$
** $p < .01$

perceptions. Achievement also varies by class, and this variability fully accounts for any community or grade level differences observed. The most interesting information yielded by this analysis is the significant interactions of the two motivational orientations with class. These interactions indicate that the relationships between the two motivational orientations and achievement vary considerably by class. Indeed, within-class simple correlations between ability orientation and achievement range from -.11 to +.84 and between effort orientation and achievement, from -.48 to +.70. These differences were pursued in further analyses.

It should be noted at this time that additional pooled regression analyses, exploring other variables, yielded non-significant results. In one analysis, the selected set of specific classroom characteristics were substituted for the class variable. Together, these characteristics accounted for 4 percent of the variance, compared to 8 percent for the class variable alone. (Within this set, however, student task absorption and teacher talk designed to maintain the activity both accounted for significant proportions of variance in the step-down procedure.) Other pooled analyses included quadratic terms for the motivational variables, observer perceptions of climate, and interactions of the two motivational orientations with grade level, sex, and SES, all with non-significant results.

Within-class results. The key results from the within-class regression analyses are presented in Table 13. Because these analyses focused on the effects of within-class variability, student characteristics, including achievement, were entered as deviations from class means (Corno, Mitman & Hedges 1981), and classroom characteristics were not entered (since they do not have any within-class variability). The

Table 13

Within-class Regression Results on Achievement

	Step-wise procedure				Step-down procedure	
Variable[a]	R	R^2	R^2 Change	F (for change)	R^2 change if deleted	F
Community Grade level Sex SES	.30	.09	.09	4.10**	.05	3.44**
Ability orientation	.62	.39	.30	192.83**	.19	124.94**
Effort orientation	.62	.39	.00	0.00	.00	3.26
Student climate perceptions	.63	.40	.01	1.05	.02	2.10
Ability orientation x class	.67	.45	.04	1.18		
Effort orientation x class	.71	.51	.06	1.73*	.10	1.73**

[a] All student characteristics, including achievement, were entered as deviations from classs means.

* $p < .05$

** $p < .01$

results presented in Table 13 are similar to those obtained from the pooled analyses. This suggests that a student's relative achievement status within his/her classroom is related to his/her relative status on the same characteristics that "affect" his/her overall achievement (ignoring class membership). In other words, the relationships between achievement and other variables found across all students are similar to those found within class.

Between-class results. The between-class regression analyses were conducted somewhat differently from the pooled and within-class analyses. First, given the small sample size (n = 21 classrooms),

separate analyses were run for different sets of independent variables. Second, independent variables were not forced in a predetermined or stepwise order, although all variables were entered. Finally, all student characteristics, including achievement, were represented as class means in these analyses. The key between-class results are presented in Table 14.

The results from analyses 1-4 indicate that average class achievement is related, though not significantly, to the average demographic characteristics of students in the class (particularly community and sex), to average student ability orientation and climate perceptions, and to measured classroom characteristics (particularly teacher talk designed to maintain the activity and student task absorption). Average achievement is also significantly related to teacher climate perceptions (especially task orientation).

Results from analyses 5-7 reflect an effort to assess possible interactive effects of motivation (aptitude) and classroom characteristics (treatment) on achievement. (Other interaction analyses with ability orientation and all analyses with effort orientation yielded non-significant results.) The results in Table 14 suggest possible interactions between ability orientation and instructional characteristics related to grouping and teacher talk. For example, a closer look at the results of analysis 6 on teacher talk designed to maintain the activity (MAINT) suggests that in low average ability orientation classes, high frequencies of MAINT were associated with higher average achievement then low frequencies of MAINT. Yet, in high average ability orientation classes, the opposite was true: high frequencies of MAINT were associated with lower average achievement than low frequencies of MAINT. In analysis 5, the amount of time teachers spent interacting with students (WT) also showed

Table 14

Between-Class Regression Results on Achievement

Analysis	Variable[a]	Forward procedure[b] R	R^2	R^2 Change	F (for change)	Step-down procedure R^2 change if deleted	F
1	Community					.38	6.07*
	Grade level					.15	2.42
	Sex					.17	5.37*
	SES	.77	.60	.60	2.74	.02	0.27
2	Ability orient					.14	4.56
	Effort orient					.01	0.28
	Student climate perceptions	.78	.60	.60	2.80	.17	1.22
3	Teacher climate perceptions:						
	Involvement					.06	2.08
	Task orient.					.22	7.38*
	Order & organ.					.01	0.21
	Rule clarity					.05	1.54
	Innovation	.74	.55	.55	3.63*	.00	0.14
4	WT					.01	0.29
	IND					.00	0.05
	GP					.00	0.05
	OTHR					.01	0.21
	MAINT					.04	0.92
	OTF					.08	2.00
	MOD					.25	6.49*
	Task Orient.					.00	0.08
	Affect	.76	.57	.57	1.65	.03	0.69
5	Ability orient x WT	.67	.45	.45	15.25**	.02	0.61
	WT					.00	0.10
	Ability orient.	.67	.45	.00	0.05	.00	0.97

Table 14 (continued)

Analysis	Variable[a]	Forward procedure[b] R	R^2	R^2 Change	F (for change)	Step-down procedure R^2 change if deleted	F
6	Ability orient	.65	.43	.43	14.04**	.12	4.44
	MAINT					.05	1.89
	Ability orient x MAINT	.73	.53	.10	1.86	.05	1.86
7	Ability orient	.65	.43	.43	14.04**	.13	5.50*
	MOD	.76	.58	.16	6.68*	.13	5.56*
	Ability orient x MOD	.77	.59	.01	0.51	.01	0.51

[a] All student characteristics entered as class means.
[b] All variables entered, but not forced in any particular order.
* $p < .05$
** $p < .01$

an interaction with ability orientation. Higher average achievement was associated with relatively low amounts of WT in low average ability orientation classes, but with relatively high amounts of WT in high average ability orientation classes.

In sum, these between-class results are consistent with the pooled and within-class results, in that average achievement shows relationships (though mostly non-significant due to small sample size) to similar variables. These between-class results also yield several interesting interactions between ability orientation and specific classroom characteristics, which could serve as partial explanations for the motivation x class interactions revealed in the earlier analyses. However, difficulties in interpreting these analyses (e.g., given the

nature of the achievement variable in this study) and a perceived need for a better understanding of relationships among sets of variables led to a shift in analysis strategy from multiple regression to canonical correlation (or multivariate regression), the results of which are reported in the next section.

Canonical Correlation Results

Three principal sets of variables were used in the canonical correlation analyses: student characteristics (demographic, motivational, achievement); classroom characteristics (grouping structure, teacher behavior, teacher subject matter verbal behavior, student task absorption); and climate perceptions (student, teacher, and observer). These analyses focused on exploring interrelationships among these sets of variables at each of the three levels of analysis.

Student-level (pooled) results. The student-level results, presented in Table 15, show the following major patterns.

1. Unlike the individual correlations, the aggregate relationship between student and classroom characteristics is significant though still modest in magnitude. Like the individual correlation results, the largest contributors to this aggregate relationship are, among the predictor variables, student SES, ability orientation, and achievement, and among the criterion variables, amount of observed time teacher was not interacting with any students (NO INTER), teacher use of TELL and MAINT, and student task absorption. (This interpretation was based on a review of the correlations between individual and canonical variables.)

2. Classroom characteristics (in turn) are significantly related to student climate perceptions, and this relationship is stronger than that between student characteristics and student climate perceptions. Major

Table 15

Student-Level (Pooled) Canonical Correlation Results[a]

Predictor variables	Criterion variables	Can R	Can R^2	F	1-Λ[b]
Student char Sex, SES Ability orient Effort orient Achievement	Classroom char WT, IND, GP, OTHR NO INTER TELL, MAINT OFF, MOD	.44 .28 .25	.20 .08 .06	3.36** 2.01** 1.58*	.32
Student char (same as above)	Student climate percept (5 dimensions)	.47	.22	4.82**	.28
Student char (same)	Teacher climate percept (5 dimensions)	.35 .24	.13 .06	3.59** 2.32*	.21
Student char (same)	Observer climate percept Task orient, Affect	.20	.04	1.91*	.05
Classroom char (same as above)	Student climate percept (5 dimensions)	.56 .36	.32 .13	5.42** 2.68**	.45
Student climate percept (5 dimensions)	Teacher climate percept (5 dimensions)	.47 .25	.22 .06	5.74** 2.48**	.30
Student climate percept (5 dimensions)	Observer climate percept Task orient, Affect	.48 .17	.23 .03	12.35** 2.89*	.26

[a] Only significant canonical variables are reported.
[b] 1-Wilks' Λ = total amount of variance accounted for.
* $p < .05$
** $p < .01$

contributors to the former relationship include all predictor and criterion variables except classroom grouping information.

3. Teacher and observer climate perceptions both show modest relationships with student climate perceptions. Teacher, but not observer perceptions also show modest links to student characteristics.

Between-class results. The between-class canonical results are shown in Table 16. Although nearly all of these analyses revealed large amounts of explained variance, nearly all also yielded non-significant tests of significance. This lack of significance can be attributed primarily to the large number of variables, relative to the small sample size in these analyses (n = 21 classrooms). (For example, several of the analyses shown in Table 16 were rerun with fewer variables. The results included a small decrease in variance accounted for and significant F-tests.) Given the exploratory nature of this study and the desirability of maintaining comparability from one level of analysis to the next, additional between-class analyses (i.e., striving for statistical significance) were not run. Rather, the results in Table 16 were interpreted as revealing the following major patterns. (These interpretations are again based on reviews of the correlations between individual and canonical variables.)

1. Like the pooled analyses, the largest contributors to the aggregate relationship between average student and classroom characteristics are student SES and achievement and classroom NO INTER, TELL, MAINT, and task absorption. That is, these results suggest that some classroom practices, such as kind of subject matter talk, may be influenced by students' SES and achievement levels.

2. Similar, along with some additional classroom characteristics (in turn), appear to be linked with specific average student climate

Table 16

Between-Class Canonical Correlation Results[a]

Predictor variable	Criterion variables	Can R	Can R^2	F	1-Λ[b]
Student char Sex, SES Ability orient Effort orient Achievement	Classroom char WT, IND, GP, OTHR NO INTER TELL, MAINT OFF, MOD	.96	.91	1.69	.99
Student char (same as above)	Student climate percept (5 dimensions)	.91	.83	1.47	.90
Student char (same)	Teacher climate percept (5 dimensions)	.84	.71	1.70	.92
Student char (same)	Observer climate percept Task orient, Affect	.63	.40	0.96	.45
Classroom char (same as above)	Student climate percept (5 dimensions)	.93	.86	1.23	.99
Classroom char (same)	Teacher climate percept (5 dimensions)	.88	.78	1.01	.98
Classroom char (5 dimensions)	Observer climate percept Task orient, Affect	.95	.91	2.84*	.92
Student climate percept (5 dimensions)	Teacher climate percept (5 dimensions)	.81	.65	1.50	.90
Student climate percept (5 dimensions)	Observer climate percept Task orient, Affect	.75	.56	2.14	.68
Teacher climate percept (5 dimensions)	Observer climate percept Task orient, Affect	.61	.38	1.32	.54

[a] Only the first canonical variable is reported for each analysis.
[b] 1-Wilks' Λ = total amount of variance accounted for.
* $p < .05$

perceptions. The largest correlations in this canonical relationship were shown for frequency of small group instruction, NO INTER, TELL, and student task absorption with climate dimensions of rule clarity and involvement.

3. Like the pooled analysis, the canonical relationship between average student characteristics and average student climate perceptions is not as strong as that between classroom characteristics and average student climate perceptions. At both levels of analyses, the two motivational orientations show the strongest correlations, as do the three climate dimensions of involvement, order and organization, and task orientation.

4. Teacher climate perceptions of all dimensions except innovation, and especially of task orientation, are linked primarily to average student achievement and ability orientation. Teacher climate perceptions of innovation, and of task orientation, are linked to such classroom characteristics as overall interaction time with students, use of TELL and MAINT, and student task absorption.

5. Finally, observer climate perceptions show relatively weak links to student characteristics and to student and teacher climate perceptions and the strongest links to the classroom characteristic of student task absorption.

Synthesis of pooled and between-class results. Together, the pooled and between-class results suggest a number of hypotheses about the interrelationships among student demographic, motivational, and achievement characteristics; classroom procedures; and classroom climate perceptions. These hypotheses are clearly speculative and are intended as possible directions for future research, rather than conclusive inferences from the present study.

1. Some instructionally-related classroom procedures, such as overall teacher interaction time with students and teacher use of telling, questioning vs. maintaining in subject matter verbal interactions with students, may be influenced by the SES and general achievement levels of students in that class.

   E.g. In relatively low SES or achievement classes, teachers spend less time interacting with students (i.e., more individual seat work) and more time telling or imparting information about the subject matter. In relatively high SES or achievement classes, (the same) teachers spend more time interacting with students (in small or large group format) and more verbalization time maintaining an academic activity (vs. imparting information or asking questions).

2. Student perceptions of classroom climate may be more strongly influenced by classroom characteristics than by individual or class average student characteristics. The former relationship may include such classroom characteristics as grouping structure, overall teacher interaction time, teacher subject matter verbal behavior, and student task absorption. In the latter relationship, individual student climate perceptions may be more strongly affected by their motivational than by their achievement characteristics, while average class-level student climate perceptions may be influenced by both the average motivational and achievement characteristics of the students in that class.

   E.g. Student climate perceptions are more positive in classes with relatively high amounts of teacher interaction time, including small group work; of teacher subject matter verbal behavior designed to maintain the activity (vs. tell or question); and of on-task student behavior.

   E.g. Across classes, students with high ability and/or effort motivational orientations have more positive climate perceptions than students with low motivational orientations.

   E.g. On the average, class-level student climate perceptions are more positive in high vs. low average ability orientation, effort orientation, and/or achievement classes.

3. Teacher perceptions of classroom climate may be influenced by both student and classroom characteristics. Teacher perceptions of such climate dimensions as task orientation, order and organization, and involvement may be influenced by the average achievement and ability orientation levels of students in that class. Teacher perceptions of the climate dimensions of innovation and task orientation may be influenced by the kinds of classroom characteristics measured in this study.

   E.g. Teacher perceptions of task- and rule-oriented dimensions of the classroom environment are more positive in high vs. low average achievement and/or ability orientation classes.

E.g. Teacher perceptions of the degree of innovation and task-orientation in the classroom environment are more positive in classes with high vs. low amounts of overall teacher interaction time, teacher use of MAINT (vs.TELL), and student task absorption.

Within-class results. Finally, Table 17 displays a glimpse at within-class results, which must be interpreted cautiously given the small sample sizes. These results clearly show substantial class to class variation in the interrelationships among student characteristics and in the relationships between student characteristics and student climate perceptions. When combined with the descriptive data and with the classroom narrative information, these results can provide class profiles, and additional hypotheses for future research.

For example, class #3 shows the smallest relationship between student motivation and achivement and a much larger one between student sex, SES, motivation and achievement. This class had among the highest mean scores on both motivational orientations and achievement, a grouping structure dominated by individual and small group work, teacher verbal behavior characterized primarily by questioning and maintaining, and a high level of student task absorption. This class was also described by the observer as "organized," with students who did not "appear bored or restless in spite of a slow-paced and predictable routine."

Class #2, in contrast, showed a sizeable relationship between student motivation and achievement, to which student sex and SES added very little. On the average, students in this class were low on ability orientation and a little lower than average on effort orientation and achievement. The grouping structure in class #2 was highly variable; teacher verbal behavior was evenly distributed among telling, questioning, and maintaining; and student task absorption was also highly

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Table 17

Results of Analyses by Class

Class	GLM 1[a] n	GLM 1[a] R^2	GLM 1[a] F	GLM 2[b] n	GLM 2[b] R^2	GLM 2[b] F	Canonical correlation n	Canonical correlation Can R^{2d}	Canonical correlation F
1	22	.46	8.21**	22	.75	5.90**	21	.74	1.44
2	19	.73	21.42**	19	.76	5.11**	19	.90	2.03*
3	16	.10	0.75	16	.69	3.41*	16	.83	1.28
4	24	.62	17.24**	24	.82	10.20**	22	.70	1.50
5	20	.40	5.67	20	.59	2.48	20	.25	0.35
6	22	.49	9.10**	22	.61	3.14*	20	.53	0.83
7	14	.52	6.07*	14	.77	2.83	13	.91	1.20
8	17	.54	8.24**	17	.73	4.59*	17	.65	0.82
9	16	.37	3.85*	16	.73	4.01*	16	.89	1.47
10	12	.32	2.12	12	.65	1.06	12	.94	1.05
11	18	.25	2.49	18	.46	1.19	17	.83	1.47
12	21	.62	14.56**	21	.81	10.28**	19	.77	1.20
13	19	.30	3.50	19	.48	1.47	18	.59	0.90
14	20	.50	8.55**	20	.77	5.75**	20	.46	0.69
15	19	.29	3.22	19	.60	3.01*	17	.72	1.18
16	19	.33	3.87*	19	.53	1.74	18	.76	1.61
17	11	.43	2.98	11	.61	0.66	10	e	
18	13	.47	4.37*	13	.83	5.03*	13	.92	0.98
19	19	.24	2.49	19	.53	2.28	17	.75	1.25
20	25	.35	6.05**	25	.60	3.60*	24	.63	1.60
21	20	.46	7.39**	20	.50	1.69	19	.67	0.88

[a] IVs = ability and effort orientations; DV = achievement
[b] IVs = sex, SES, ability and effort orientations; DV = achievement
[c] Predictors = sex, SES, achievement, ability and effort orientations; Criteria = student climate perceptions
[d] Canonical correlation reported is first canonical variable.
[e] Sample size insufficient for analysis

* $p < .05$
** $p < .01$

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variable. The observer described this class as lacking "order and organization" and as one with "rampant confusion and chaos."

Concluding Remarks

This NIE-funded research study was highly successful, both in accomplishing its intended purposes and in generating a myriad of hypothses for future research. The major purpose of the study was to investigate the interrelationships among motivational variables related to elementary students' classroom motivation. This purpose was clearly fulfilled by emergence of two distinct motivational orientations from the data collected and the interpretative linkages proposed between these two motivational orientations and existing theory and research. This study also collected some data on classrooms, with the intent of exploring possible relationships among student motivation, student achievement, classroom instructional characteristics and classroom climate perceptions. Though clearly speculative, these data proved to be a rich source of hypotheses about these interrelationships. The next stage in this research effort will focus on (a) assessing the validity of the two motivational orientations proposed (through both replication and experimental means) and (b) investigating more accurately and more comprehensively a selected set of classroom characteristics and their links to both motivation and achievement.

Footnotes

[1] While not unsatisfactory, many of these estimates are moderate in size, suggesting the existence of some within-person variability in responses to items on these various measures. As recently argued by Atkinson (1981), however, classical test theory, including internal consistency reliability, may be irrelevant to efforts to construct "an advanced motivational psychology." That is, within-person variability, in terms of different motivational responses to different situations, may be theoretically meaningful, though not psychometrically consistent.

[2] Pilot testing had indicated that evaluations of the importance of each cause were too difficult for fourth graders. Thus, frequency rather than importance was selected for the response scale.

[3] Because of measurement problems with both of the procedures used in this study to evaluate the accuracy of students' self-concept of ability, the results of these efforts are not reported.

[4] Excluded from this set of classroom variables because of high correlations with variables and/or redundancy of information (e.g., sets of proportional variables totalled 100 percent) were NOISE, TOT, QUEST, NO CHOICE, and ROU.

[5] The effort to develop clusters of classrooms in this study was an attempt to avoid this statistical problem. Although meaningful clusters were identified from the grouping structure data, these clusters did not hold up upon examination of the rest of the classroom variables.

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